

STATE OF NEW HAMPSHIRE SITE EVALUATION COMMITTEE

RE: Application of Antrim Wind, LLC for Certificate of site and)
facility to construct up to 28.8 MW of wind electric generation)
in the Town of Antrim, Hillsborough County, New Hampshire)
and operate the same (SEC Docket # 2015-02).)

PRE-FILED DIRECT TESTIMONY OF RICHARD BLOCK

Q: Please state your name and address.

A: Richard Block, 63 Loveren Mill Road, Antrim, New Hampshire 03440.

Q: What are your qualifications to speak to the application presently before the Site Evaluation Committee?

A: I have lived in Antrim since 1988. Our property consists of a house and farm on 242 south-sloping acres on the south side of Windsor Mountain, directly across Route 9 from, and in full view of, the Tuttle Hill ridge, less than a mile from the proposed wind turbine site. We estimate that at least five of the proposed wind turbines will dominate the view from our living room and kitchen picture windows. While it was standing, the 196-foot meteorological tower erected by Antrim Wind Energy, LLC ("AWE") was clearly visible through those windows.

Q: How has your conservation commitments made you sensitive to the fate of Tuttle Hill?

A: Over the 28 years we have lived here, I have served on the Antrim Conservation Commission, the Contoocook and North Branch Rivers Local Advisory Committee, and as a New Hampshire Coverts Cooperator. Since its creation as part of Antrim's 1989 revision to the Zoning Ordinance, my wife Lorraine and I have been active proponents for and

supporters of the Rural Conservation District (“RCD”), starting with our successful petition in 1990 to extend the District to the town line across the north side of Route 9. On two occasions, we were instrumental in fighting off proposals to create a prison in the North Branch region of Antrim. In 1999, the Society for the Protection of New Hampshire Forests named us as informal stewards for the Nature Conservancy’s Loveren Mill Cedar Swamp property and the Meadowsend Timberland forestry holding because of our historical, cultural, and environmental concerns for the region.

Since 2013 we have actively opposed the AWE proposed siting of an industrial wind facility in the RCD, due to the Antrim Zoning Ordinance’s specific prohibition of industrial activity and tall structures in this district and the potential negative impact of such a facility on the greater region. We were the primary appellants in several appeals of Planning Board and ZBA decisions about AWE’s applications and were also the plaintiffs in two Superior Court suits against the Town of Antrim challenging the permitting of the met tower. Both my wife and I were Intervenor in SEC Docket #s 2011-02, 2012-01, and 2014-05 as well as the current Docket # 2015-02.

Q: Have you previously testified before the Site Evaluation Committee?

A: Yes. I submitted written and oral testimony in all of the above-mentioned dockets and additionally served as the spokesperson for the Non-Abutting Intervenor’s Group in all proceedings, conducting cross-examination and responding to questioning from AWE and their attorneys.

Q: What is the purpose of this pre-filed testimony?

A: The purpose of this testimony is to provide the Site Evaluation Committee (“SEC”) with information demonstrating that AWE has been misrepresenting the current project proposal in its application and that, in fact, the current project configuration is little changed from the project in SEC Docket #2012-01 which was denied by the SEC, both in the initial application and in their appeal. The Visual Assessment (“VA”) of the current project proposal fails to prove that there has been any significant improvement in the aesthetic

impact of the project. Since the physical characteristics have changed so little, the VA draws its conclusion by using deceptive methodologies and inaccurate findings to depict the project in a highly biased manner.

Q: What are your professional qualifications to address the issues you have raised regarding Mr. Raphael's distorted assessment document?

A: My professional qualifications include a bachelor's degree with dual majors in two- and three-dimensional design as well as in technical theater including modeling and visualization of scenic and architectural designs. I also have a Master of Fine Arts with a specialization in design, intermedia, and computer graphics. Since 1980 I have taught design, visual studies, and graphic communications on the college level, including courses involving digital photography and computer image manipulation using programs like Photoshop. For the last 30 years I have served as Professor of Graphic Communications and Information Technology and Graphic Communications Department Coordinator at Franklin Pierce University in Rindge, New Hampshire. Prior to my college-level teaching I also worked as an art director and creative director in the advertising and public relations industry and as a cartographer for the State of Massachusetts. Over the last twenty years I have made a specialty study of the visual and graphic representation of quantitative information, culminating in study with the renowned author and expert on data visualization, Edward Tufte, Professor Emeritus of Political Science, Statistics, and Computer Science at Yale University.

My complete resumé is attached as Exhibit RB-1.

Q: How does AWE's Visual Assessment distort the aesthetic impact of this project proposal?

A: The current configuration of the AWE project actually differs very little physically from the original project applied for in SEC Docket # 2012-01. The removal of turbine #10 does not significantly change the overall footprint of the project [see attached Exhibit RB-2]. When the current project map is overlaid upon the original layout map of the 2012 project rejected by the SEC, it is clear that the footprint of the proposed "different project"

is almost identical. Aside from the elimination of the short stretch of access road between turbines #9 and #10, the remainder of the road layout is absolutely the same. The shortening of the height of turbine #9 is of minimal consequence. At 446.2 feet, it is still at 91% of the height of the original proposal, would be over 170 feet taller than the tallest building in the state, and still taller than any wind turbine now in operation in New Hampshire. The height reduction by 38 inches of the remaining turbines is infinitesimal and would have no measurable effect on their aesthetic impact across the region.

With little difference in the project configuration to work with, in order to claim a lessened aesthetic impact of the “new” project layout, Mr. Raphael resorts to designing his assessment methodologies to achieve the results he desires, which is that there are *NO* resources within the study area that would have a high visual impact. Rather than identifying what areas would have a visibility of the turbines and how much aesthetic impact there would be, the assessment process appears to be aimed at systematically *eliminating* as many resources as possible. This result is very effectively achieved by the methodologies employed in the VA.

Mr. Raphael starts with several problematic assumptions. First, he relies on a composite of methodologies identified in the Bureau of Land Management’s *Visual Resource Management* and the United States Forest Service’s *Scenery Management System*, as well as the Federal Highway Administration’s *Visual Impact Assessment for Highway Projects*. As pointed out in the VA, these were all intended primarily to assess lands located west of the Mississippi, and to deal with regions of national significance such as National Parks and National Forests.

The SEC rules for addressing the effects on aesthetics by a proposed industrial wind project [Site 301.05 b:5] specify the assessment shall identify “all scenic resources within the area of potential visual impact” (10 miles in the case of wind energy systems.) There is no distinction made about whether a resource has national, state, regional, or local significance. Mr. Raphael’s assessment immediately limits itself to “resources that have a scenic value or purpose associated with them and where public access is established.” [AWE VA page 6]. He then eliminates *all* private commercial businesses and residences. The remaining resources are further culled by eliminating any which do not fall within one of three listed categories [AWE VA pages 7-8]. The resulting inventory list of 290 resources is displayed as Table 2 on pages 49-59 of the VA.

This list is then subjected to the VA's viewshed mapping process to determine whether or not each resource has any project visibility. The essential problem with this procedure is the great inaccuracy in the viewshed maps. This inaccuracy and the distortion and misrepresentation of data which results is discussed later in this testimony. Mr. Raphael describes the maps he has generated as "the first step in ruling out those areas with no visibility" [AWE VA page 9]. This further confirms his goal of eliminating as many resources as possible.

Based on the circular logic of the application of the seriously flawed viewshed map, and before any further consideration of the potential aesthetic impact is examined, the initial inventory list of 290 resources is on the very next page [AWE VA page 60] immediately reduced to only 30 resources. Thus, it is obvious that the seemingly large list of resources which Mr. Raphael has devoted 11 pages to listing is mere lip service, since, in actuality, he never really considers 90% of them.

At this point, the VA starts to employ numerous methods to obfuscate the further reduction in number of resources with potential visibility by applying various complicated and arbitrary rating systems to "quantify" these remaining 30 resources. Using several differing numbering systems and several arbitrary assignments of rating scores, the VA attempts to reduce all aspects of the visual impact for each resource to an assignment of a "Low", "Moderate", or "High" rating. The first round of ratings is applied by listing whether a resource has been mentioned in one or more arbitrarily selected guide books and websites. Then the scenic quality is rated using the aforementioned Bureau of Land Management method of assessing western scenic resources with an unexplained scoring system which seems to range from -4 to +4. These two rating charts are then combined into an Overall Sensitivity Rating [AWE VA page 71], resulting in the further elimination of 20 more resources. The remaining 10 resources [AWE VA page 82] are therefore the only resources of the original 290 which are subsequently analyzed for visual effect.

It is at this stage that Mr. Raphael's methodologies clearly demonstrate how he manipulates the data to achieve his desired end result of no impacted resources. He evaluates six categories and again assigns arbitrary "Low", "Moderate", or "High" ratings in each. The proof of this manipulation is the groundless decision that only resources gaining a cumulative "High" rating can be considered as receiving a potential visual impact from the turbines, and then establishing rating systems in several categories in which a "High" rating

is impossible to achieve. The most egregious and obvious of these is the first category, “Number of Turbines Visible” [AWE VA page 82]. The rating system in this category is defined as follows:

- **Low:** 1-7 turbine hubs
- **Moderate:** 8-15 turbine hubs
- **High:** 16+ turbine hubs

It should be obvious that for a project proposing an installation of 9 turbines, a rating of “High” is impossible to achieve and only a few resources could achieve a rating of “Moderate”. The rating scale employed by Mr. Raphael can only be assumed to be designed to prove his claim that no resource will suffer any significant visual effect. A similar result is achieved in the assessment of “Proximity or Distance” [AWE VA page 83] with a scale rating of:

- **Low:** > 6 miles
- **Moderate:** 2-6 miles
- **High:** < 2 miles

Since almost no resources were even selected in close proximity to the proposed project site, most of the resources on the list receive a “Low” rating.

With the same kind of impossible-to-achieve “High” rating system established for the determination of “Visual Clutter/Landscape Coherence” [AWE VA page 86] Mr. Raphael has guaranteed a “Low” or “Moderate” overall rating [AWE VA page 87] for all but one “Sensitive Resource” out of the original 290. This last resource, Willard Pond, only achieves a “Moderate-High” rating which Mr. Raphael proceeds to degrade to only “Moderate” in the next three pages by demoting Willard Pond’s “Extent of Use” because no motorized boats are allowed, downgrading the “Duration of View” because paddlers and fishermen have “ever changing” views, and reducing the “Remoteness” rating because “It is not identified by NH Dept. of Fish & Game as a ‘remote trout fishery’”.

Additionally, the VA’s rating systems for these last analyses are self-contradictory. For “Extent of Use” a “High” rating is given if “Access is quick, obvious, and easy. Interaction between users is moderate to high.” However, for “Remoteness” a “High” rating is given if “Access is generally difficult and off-the-beaten path. Interaction between users is

extremely rare". Obviously a "High" rating cannot be achieved in both of these categories, since they are direct opposites. This type of assessment manipulation is obviously designed to guarantee that no resource in the VA can achieve an overall "High" rating.

Q: What problems do you see with the VA's viewshed mapping?

A: The initial and immediate elimination of 90% of the identified resources is based entirely on the viewshed maps prepared by LandWorks for the VA. The main problem with this methodology is that these maps are highly inaccurate. The data used in determining the visibility of the project from any given spot within the prescribed impact area (a ten-mile radius around each turbine) was obtained from several sources and processed by LandWorks' software to result in maps which then display how visible the project is over the entire area. The VA admits the inaccuracy of this method, stating "Due to the coarseness and uncertainty of the quality of the data, viewsheds cannot be relied upon to represent what will actually be seen on the ground from a specific location." [AWE VA page 8] However, relying on this uncertain data is exactly what Mr. Raphael proceeds to do in order to initially eliminate 90% of the resource list.

There were four levels of viewshed mapping completed for this project: 1) topography only from the blade tips, 2) topography only from the turbine hub, 3) topography and vegetation from the blade tips, and 4) topography and vegetation from the turbine hubs. This mapping is in descending order of visibility, and Mr. Raphael chooses the final and most restrictive map, *the view from the hubs*, to use as his basis for resource elimination. He rationalizes this choice with the statement that "It is agreed by most experts that viewsheds generated from the hub provide a more realistic representation of potential visibility, since the view of a hub and rotor has a greater effect than turbine blades because turbine blades that rise above treeline are not typically visible or dominant." [AWE VA page 10] There is no reference data supporting this statement, no link to identifying who "most experts" are and in what publications they "agree", and no explanation whatsoever of why the view of a static hub has more dominance than the effect that massive spinning blades has on an observer. All prior visual assessments submitted to the SEC in AWE's applications considered turbine height and visibility from the blade tips.

It is an obvious fact that the eye of any observer of an industrial wind turbine facility is initially attracted to, and ultimately held by the unnatural spinning movement of the extremely large turbine blades in an otherwise still environment. By declaring that the spinning blades “are not typically visible” and thus arbitrarily using only visibility data derived from hub height, *Mr. Raphael has effectively shortened the turbine height by over 180 feet – to only 63% of their actual height.* This is but one of the deceptions used to try to demonstrate how this version of the project proposal would have less of a visual impact than the original rejected proposal.

Q: What additional problems do you see with the VA’s viewshed mapping?

A: The viewshed map selected by Mr. Raphael to use in the elimination of resources has been severely limited by the application of overall masking in the form of a “prescribed tree height” added to the original digital elevation model. [AWE VA page 9] As a result of this additional limitation in visibility, “the output is further reduced by eliminating areas that are forested.” [AWE VA page 9] The complete avoidance of analysis of any possible visibility from all areas identified as forested is another example of the VA’s goal of systematically eliminating all scenic resources from consideration. Mr. Raphael characterizes his choice of applying an overall 40-foot tree high as “conservative”, declaring that “Tree heights in this region are more characteristically an average of 50 feet or higher.” However, the blanket application of an overall 40-foot tree height results in huge errors in the viewshed map where the tree heights are less or, in reality, tree cover is non-existent.

One glaring example of the inaccuracy of this method is the identification on the viewshed map of the entire area on and around the Tuttle Hill/Willard ridge as having absolutely *NO* turbine visibility, even though a viewer might be standing directly under or between several of the turbines. Although there is some limited tree cover on and around the ridge, most of what is there is under 30 feet. Additionally there are large clearings already cut around several of the proposed turbine sites. Still the viewshed map defines this area as if it had a virtually solid 40-foot tree cover throughout.

A very curious dilemma arises when one compares the viewshed maps to the map provided in the Shadow Flicker Analysis [AWE Application Attachment 6, Figure 4-2]. For example,

areas on the Tuttle/Willard Ridge identified as having no turbine visibility on the viewshed map are identified as being subjected to 30 to 150 hours of shadow flicker a year. It would seem logical that in order to experience shadow flicker, one would need to be able to see a turbine.

There are numerous other sites around the proposed project identified as have zero turbine visibility, yet field checks from some of these sights show clear views of the ridge. In Exhibit RB-3 (attached) I have included several photographs of the Tuttle/Willard ridge from places identified on the LandWorks viewshed map as having no visibility for any turbines. These locations are identified by GPS coordinates and compass direction and have been correlated to AWE's viewshed map. Obviously, if the ridge can be seen from any given location, then turbines installed on that ridge would also be clearly visible.

I have only provided photographs from a small number of sites, and one can only assume that there are probably many more sites within the 10-mile study area which are likewise mis-identified as having no turbine visibility. With this level of error, this map is absolutely useless as an assessment tool. Given the extreme inaccuracy of the viewshed map, relying on it to determine the turbine visibility from the 290 scenic resources listed at the start of the assessment and promptly eliminating 90% of them because that map says they have no visibility is further clear proof of the biased methodologies employed to achieve the desired results.

Q: Can you identify any problems with the photographs taken for use in the VA's turbine simulations?

A: Photographic simulations in a visual assessment are intended to give a viewer a sense of what the proposed wind turbine project would look like if it is approved and erected. The rules for presenting photosimulations (and common sense logic) dictate that, given the inherent limitations in two-dimensional photographic prints, the most effective simulations will make every effort to show the installed turbines in their most visible, most obvious conditions. Site 301.05b (8) states:

(8) Photosimulations shall meet the following additional requirements:

a. Photographs used in the simulation shall be taken at high resolution and contrast,

using a full frame digital camera with a 50 millimeter fixed focal length lens or digital equivalent that creates an angle of view that closely matches human visual perception, under clear weather conditions and at a time of day that provides optimal clarity and contrast, and shall avoid if feasible showing any utility poles, fences, walls, trees, shrubs, foliage, and other foreground objects and obstructions;

The requirement that the base photographs be taken “at high resolution and contrast” and “under clear weather conditions and at a time of day that provides optimal clarity and contrast” is an explicit stipulation intended to provide viewers with a simulation of turbines in a “worst-case scenario”, ie, when they are at their most visible and obvious in the landscape.

The AWE VA is not in compliance with this requirement. In fact, the admission is made that “The weather and atmospheric conditions presented in the visual simulations depict a range of conditions experienced during our site visit... due to the highly variable and changing weather of the northeast, not all photos depict sunny, blue sky conditions. However, the visual simulations depict a range of weather and light conditions that are typical of the area.” The Site 301.05 rules are very uncomplicated and specific: “clear weather conditions and at a time of day that provides optimal clarity and contrast”, not “a range of weather and light conditions that are typical.”

In fact, when the photosimulations included in the VA are examined, one sees that *not one* of them is based on a photograph taken on a clear, sunny day:

EXHIBIT #	LOCATION	CLAIMED WEATHER CONDITIONS	ACTUAL VISIBLE CONDITIONS
6	Bald Mountain	Partly sunny	Quite hazy
7	Franklin Pierce Lake	Partly sunny	Extremely hazy
8	Gregg Lake	Partly sunny	Quite hazy
9	Island Pond	Partly sunny	Overcast
10	Pitcher Mountain	Cloudy	Hazy, low clouds
11	Crotched Mountain	Partly sunny	Extremely hazy
12	Willard Pond Launch	Partly sunny	Cloudy
13	Willard Pond Northeast	Partly sunny	Cloudy
24	Gregg Lake Road	Partly sunny	Overcast
25	Private Residence, Hillsboro	Partly sunny	Cloudy
26	Private Camp, Windsor	Partly sunny	Cloudy, overcast

This is in clear violation of the SEC rules for preparing photosimulations. An additional stipulation in the rules states that base photographs shall avoid showing “any utility poles,

fences, walls, trees, shrubs, foliage, and other foreground objects and obstructions.” The rationale behind this should be obvious: foreground distractions diminish the visual impact of the turbines on the viewer. Four of the above photosimulations do contain significant foreground distractions:

EXHIBIT #	LOCATION	DISTRACTION IN THE FOREGROUND
8	Gregg Lake	Sailboat with vertical mast
11	Crotched Mountain	Evergreen trees, left and right
25	Private Residence, Hillsboro	Stone walls, vertical sculpture
26	Private Camp, Windsor	Vertical tree trunks, left

LandWorks, the company that prepared the VA for AWE, had an opportunity to correct these violations of the visual simulation rules when they submitted various materials on February 19, 2016 in order to “conform to the readopted rules of the Committee.” [see letter and supplementary application materials submitted 2/19/2016] Those submissions included reworked versions of the original eight photosimulations as well three new simulations. Although additional data had been added to the simulation packages, no attempt whatsoever was made to retake the original base photographs in better weather conditions, and the three new photographs, taken *after* the new rules had already been adopted by the SEC, were taken in conditions as bad or worse than those taken from the original locations. (It should be noted that the three additional simulation photographs are identified as having been taken at 12:46am, 1:23am, and 2:30am – an indication that either LandWorks equipment is faulty or that their data recording is careless – either way it casts doubts on the accuracy of *all* of their data.)

Mr. Raphael’s excuse that “the visual simulations depict a range of weather and light conditions that are typical of the area” [AWE VA page 11] is consistent with his history of creating photosimulations in a misleading manner. For the Northern Pass project, Mr. Raphael presented photosimulations of the proposed towers which were strongly criticized: “A classic example being the photo simulation from Bethlehem, New Hampshire from The Rocks (Estate) area where it is a photo taken in October at 5:30 in the afternoon looking east and the corridor is in the deep shadow of the day. It is almost a night-time look.” [see Exhibit RB-4, “AMC Says Northern Pass Would Have ‘Visual Impact’ on 95,000 Acres”, New Hampshire Public Radio, September 26, 2012] The response to this was, “David Raphael, a landscape architect, planner and principal at LandWorks, said the late-afternoon timing was not inappropriate because people might go there at the end of the

day.” In neither this case nor the case of the current AWE project, has Mr. Raphael made the slightest attempt to present photosimulations which will demonstrate their logical intent, to show a viewer the potential visual impact of a proposed project.

Q: Can you identify any problems with the depiction of the wind turbines in the VA’s photosimulations?

A: When superimposing pictures of wind turbines on a base photograph, it is important to strive for accuracy, 1) in the specific image to assure a realistic rendition of the make and model of the turbines to be used, 2) in the size of the turbine images so they look accurate within the setting of the landscape based on their scale compared to surrounding settings and proximity to the viewer, and 3) in the coloring and contrast of the turbine images so that they appear both realistic and accurate in the context of the base photograph and so that they retain the maximum visibility impact they would have on a viewer under ideal conditions.

Although much of the calculations for location and sizing of turbine images placed on a base photo are accomplished using computer software and is fairly straightforward, ultimately the exact visual characteristics applied to each turbine image must still be decided upon by the person creating the final rendering, particularly as it relates to #3 above, the coloring and contrast. The concept of color and contrast in the context of objects placed in a photographic landscape is very complex, involving aerial perspective and a grasp of how weather conditions and atmospheric quality affect visibility.

Aerial (or atmospheric) perspective is the term used for how atmospheric conditions influence our perception of objects in the distance. As objects get farther away, they appear lighter in tone, less detailed, and bluer or cooler in color. This effect is easily seen in landscapes of distant hills and, due to the presence of dust or moisture particles in the air, is even more pronounced on hazy days. A good example of this is LandWorks’ base photograph of the view from the Pitcher Mountain fire tower where one can observe the more distant hills appearing lighter, bluer, and with less detail than those closer to the viewer:



The addition of turbine images to a photograph and the matching of aerial perspective tonalities is by no means an objective mechanical process, but is a rather subjective art that takes an eye with training to achieve with any accuracy or realism. Two different artists dealing with the same or similar landscapes to render turbine simulations can achieve very different results depending on how they apply the principles of color and contrast to the turbine images as they are added to the base photograph. When comparing photosimulations prepared by Jean Vissering for SEC Docket # 2012-01 to those prepared by David Raphael for the current application, one can observe a more careful application of aerial perspective by Ms. Vissering in order to achieve a more realistic effect when turbines are to appear at varying distance from the viewer. In the case of Mr. Raphael's simulation of turbines seen from Bald Mountain [AWE VA Exhibit 6] the uniform application of contrast and color to all turbines in the view regardless of distance from the viewer results in a simulation where the turbines on the left side of the photo which would be located on the nearer ridge actually appear as if they are farther away and on the more distant ridge. [see Exhibit RB-5]

One must be extremely careful not to overuse aerial perspective when creating photosimulations. This is why the SEC Site 301.05b (8) rules specify:

- e. When simulating the presence of proposed wind turbines, the following shall apply:
 - 1. Turbines shall be placed with full frontal views and no haze or fog effect applied;
...
 - 3. Turbine blades shall be set at random angles with some turbines showing a blade in the 12 o'clock position;

Unless base photographs are taken carefully observing the rule previously mentioned which specifies “clear weather conditions”, the resulting simulation will require an excessive amount of aerial perspective qualities applied. This will then appear as if a “haze or fog effect” has been employed. This will deceptively make the turbines much less visible as if their visual impact was far less. Avoiding this situation was the rationale for the Site rules to plainly require clear days with optimum visibility and no haze or fog. In the case of Exhibits 7 and 11 in the VA (Franklin Pierce Lake and Crotched Mountain Summit Trail), the base photographs were taken on extremely hazy days making it necessary to apply an excessive amount of aerial perspective qualities to give the turbines some sense of realism in that setting. This results in them being almost invisible:

Detail of Exhibit 7: Franklin Pierce Lake



Detail of Exhibit 11: Crotched Mountain Summit Trail



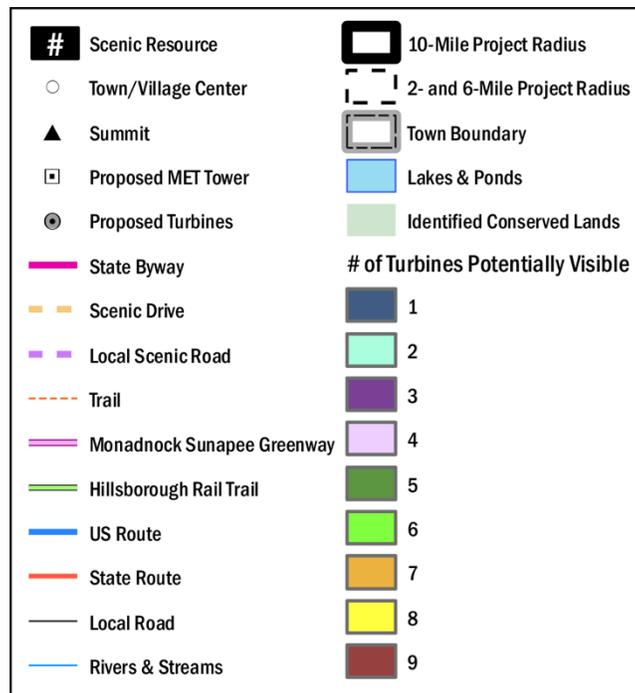
Ironically, in the closing pages of the VA, all of the photographs taken by LandWorks at the Antrim area lakes were done so on days that had blue, mostly cloudless skies. [AWE VA pages 123-130] One might question why the base photographs for the simulations weren't taken on those days. It should also be noted that the Site rules also require that some turbines should show a blade in the 12 o'clock position. This is intended to give a viewer a sense of the true height of the proposed facility. In fact, throughout the set of photosimulations submitted by LandWorks in the VA there is not one turbine rendered in the 12 o'clock position.

Q: Are there any problems with the way data is presented in the VA?

A: One of the most significant presentations of data in the VA is the series of viewshed maps [see AWE VA Exhibits 1-4]. The data represented on these maps is presumed to have derived from a substantial set of figures from multiple sources combined to generate a final value for every cell in the examined area. If this final data was presented in the form of a table of numbers with final figures simply cross-referenced to an identifying cell number, the information would be there but show no interrelationship between cells and no direct correspondence to location, which is presumably the prime focus of this data.

Thus, the data is superimposed on geographic maps of the region, and "is displayed using color-coding to show the number of structures that are potentially visible." [AWE VA page 9]. It is the application of this color-coding that results in a data map which is illogical at

best, and ultimately serves to obscure the significance of the information conveyed. Each of these viewshed maps includes a key to the coding, which indicates a specific color assigned to each area on the map based on how many turbines should be visible from that location, with a different color assigned to one turbine visible, two turbines visible, etc.:

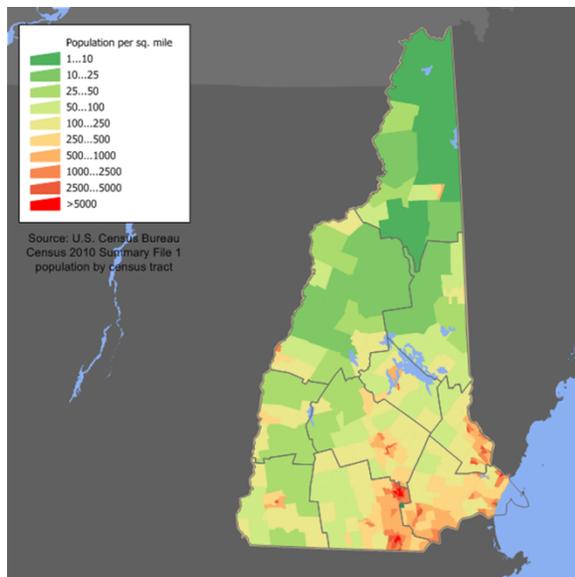


The major problem with the coding system used on these viewshed maps is that they have no logical basis in how the colors have been assigned. It can be seen in the map key above that the table of color swatches assigned to turbine visibility, while arranged in numerically ascending order, has no pattern or predictability in the arrangement of hues. Spectral color and lightness or darkness value have no pattern. The color swatches are assigned in a totally random fashion. Value (or relative lightness or darkness) is a common way that the eye groups colors, yet the values of these swatches are so haphazardly arranged that the swatches for 8 turbines, 2 turbines, and the color assigned to “Identified Conserved Lands” have equal impact on the maps. The colors assigned to 9 turbines and 3 turbines are so similar in value as to be difficult to separate on the maps. Absolutely no patterns of turbine visibility can be detected from the color coding on any of the viewshed maps.

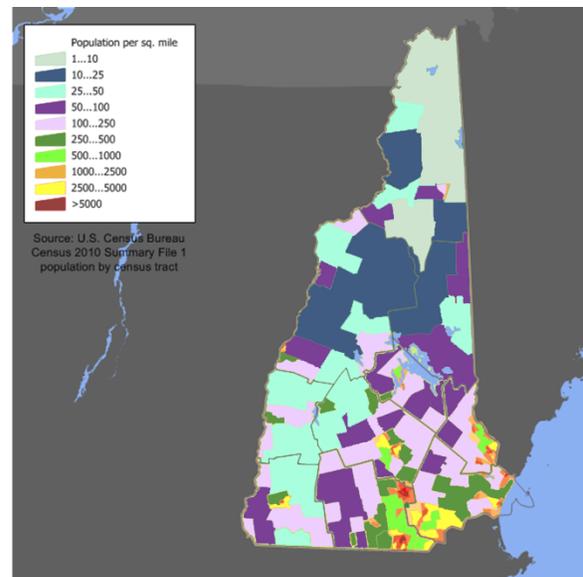
Most creators of color-coded data maps utilize a color scale that has some sort of gradient or predictability to more clearly display the trends and patterns which usually characterize

mapped data. One example I found was a population density map of the State of New Hampshire. The population of the various counties and communities in the state are color-coded as to the population per square mile. Dark green is assigned to a density of 1-10, a lighter green for 10-25, a still lighter green for 25-50, and so on. The color changes from greens to yellows to orange to red as the density increases to >5000 people per square mile. This system is totally logical as the sparsely populated regions appear green as if wooded and undeveloped, the areas with middle ranges of density appear paler and yellow as if cleared and more developed. The red areas are clustered in the southeast part of the state where the cities are located (hotspots?) See the map on the left below.

For the sake of illustration I altered the same map to use instead the random color scale from the viewshed maps in the same order and applied those colors to their appropriate regions. The result is a map with no discernable pattern, no informative trends which convey to us a deeper meaning of the data when applied over the geographic distribution. It is a random patchwork which would require a lot more work on the part of the viewer to understand. See the map on the right:



Population density in New Hampshire (Source: Wikipedia)



Same map using LandWorks viewshed map color keying

The viewshed maps provided by LandWorks, demonstrably useless due to the inaccuracy of their data, thus further serve to confuse the viewer and successfully hide any discernable patterns of turbine visibility. This is complex data that can be simplified and presented in

an intuitive manner, or it can be made complex with a random color scheme which necessitate the frequent reference to the key to make it understandable. Edward Tufte explains: “Central to maintaining clarity in the face of the complex are graphical methods that *organize and order the flow of graphical information* presented to the eye.” [*The Visual Display of Quantitative Information*, Edward Tufte, Graphics Press, 2001; page 154] It appears to be the goal of the LandWorks viewshed maps to intentionally obscure any visibility patterns, while still presenting the required data.

Q: What conclusions have you arrived at concerning the Visual Assessment?

A: Edward Tufte, Professor Emeritus of Political Science, Statistics, and Computer Science at Yale University, in his books and courses on Presenting Data and Information, teaches that consumers of presentations and technical reports must be vigilant; he writes “The use of corrupt manipulations and blatant rhetorical ploys... outright lying... setting up phony alternatives, misdirection... suggests that the presenter lacks both credibility and evidence.” [*Beautiful Evidence*, Edward Tufte, Graphics Press, 2006; page 141] He later continues: “The most widespread and serious obstacle to learning the truth from an evidence-based report is *cherry-picking*, as presenters pick and choose, select and reveal only the evidence that advances their point of view... A clear sign of cherry-picking is that a report appears *too good to be true*...” [ibid.; page 144] Tufte’s conclusion is “Given the persistent threat of cherry-picking and aggressive advocacy, consumers of reports and presentations might well ask: *Do the report’s findings grow from the evidence or from the process of evidence construction? ...Does the presenter have a reputation for cherry picking? Is the particular field of inquiry notorious for advocacy and evidence corruption (...land development...)? Are the findings too good to be true? Have the report’s findings been independently replicated? How much does the decision to be made depend on the evidence in the report at hand? Who paid for the work?*” [ibid.; page 147]

As I read Mr. Raphael’s VA, a question arose in my mind: How can a large, 10-turbine industrial wind project which the SEC has determined would have a serious detrimental aesthetic impact on an entire region be transformed by the simple removal of one turbine into a project with almost total invisibility? The answer to this question lies not in how the project has been changed, but in how it is now being assessed. By developing a

methodology which ignores much of the potential viewing locations and systematically eliminates all other sensitive resources from the entire region, by deciding to look at the turbines as if the spinning blades were invisible and they were thus less than two-thirds of their actual height, by presenting photographic simulations which only demonstrate how little visual impact the turbines will have on hazy days or from far away, and by demeaning the natural resources in and around Antrim to show that there is not much here to be negatively affected, Mr. Raphael, LandWorks, and AWE have presented a report which, in my professional opinion, is a clear case of cherry-picking, of manipulating the data to achieve a too-good-to-be-true result.

Q: Does this conclude your testimony?

A: Yes, it does.